

① a) $y = x^2 \cdot \ln x$

$$\frac{dy}{dx} = 2x \cdot \ln x + x^2 \cdot \frac{1}{x}$$

$$\frac{dy}{dx} = x(2 \ln x + 1)$$

b) $y = x \cdot a^x$

$$\frac{dy}{dx} = a^x + x \cdot \ln a \cdot a^x$$

$$\frac{dy}{dx} = a^x(1 + x \ln a)$$

② a) $y = \ln\left(\frac{1}{x}\right)$

$$y = -\ln x$$

$$\frac{dy}{dx} = -\frac{1}{x}$$

b) $y = \ln x^2$

$$y = 2 \ln x$$

$$\frac{dy}{dx} = \frac{2}{x}$$

c) $y = \frac{\ln x}{x}$

$$\frac{dy}{dx} = \frac{x \cdot \frac{1}{x} - \ln x}{x^2}$$

$$\frac{dy}{dx} = \frac{1 - \ln x}{x^2}$$

③ a) $x^y = e^x$

$$\ln x^y = \ln e^x$$

$$y \cdot \ln x = x$$

$$y = \frac{x}{\ln x}$$

$$\frac{dy}{dx} = \frac{\ln x - x \cdot \frac{1}{x}}{(\ln x)^2}$$

$$\frac{dy}{dx} = \frac{\ln x - 1}{(\ln x)^2}$$

b) $y = x^{2x}$

$$\ln y = 2x \cdot \ln x$$

$$\frac{1}{y} \cdot \frac{dy}{dx} = 2 \ln x + 2x \cdot \frac{1}{x}$$

$$\frac{dy}{dx} = y(2 \ln x + 2)$$

$$\frac{dy}{dx} = 2x^{2x}(\ln x + 1)$$

④ $y = e^x(x-1)$

a) $\frac{dy}{dx} = e^x(x-1) + e^x$

$$= e^x(x-1+1)$$

$$\frac{dy}{dx} = x \cdot e^x$$

$$x \cdot e^x = 0$$

$$\boxed{x=0} \quad e^x \neq 0$$

STATIONARY POINT

b) $x=0 \quad y = e^0(0-1)$

$$y = -1$$

$$(0, -1) \quad \frac{dy}{dx} = x \cdot e^x$$



$$f'(x) = e^x + x e^x$$

$$= e^x(1+x)$$

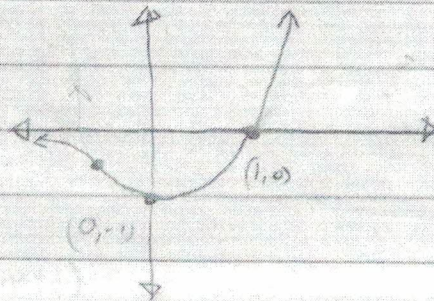
c) $e^x(x-1) = 0$

$$e^x \neq 0 \quad x-1=0$$

$$x=1$$

$$(1, 0)$$

d)



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